Branch of Forest Insect and Disease Prevention and Control
Division of Timber Management
Region Four Forest Service
U.S. Department of Agriculture
Ogden, Utah
May 1973

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STATUS OF FOREST INSECT and DISEASE CONDITIONS and PROGRAMS in the Intermountain Region 1972

TABLE OF CONTENTS

Subject — Page

RESUMÉ OF CONDITIONS

Entomology . . . 1
Pathology . . . 1

ENTOMOLOGY

Bark Beetles

Mountain pine beetle - lodgepole pine . . . 1
The impact of the mountain pine beetle on lodgepole pine . . . 3
Mountain pine beetle - ponderosa pine . . . 3
Mountain pine beetle -whitebark and limber pine . . . 4
Douglas-fir beetle . . . 4
Anti-attractant test . . . 4
Engelmann spruce beetle . . . 4
Roundheaded pine beetle . . . 5
Pine engraver beetles - lodgepole pine . . . 6
Pine engraver beetles - ponderosa pine . . . 6

Defoliators

Western spruce budworm . . . 6
A pheromone test . . . 7
Western spruce budworm impact . . . 8
Douglas-fir tussock moth . . . 8
A sawfly . . . 8
Spruce needle miner . . . 9
A leafroller . . . 9
Pine butterfly . . . 10
Western tussock moth . . . 10
California tortoise-shell butterfly . . . 10

Other Forest Insects

Lodgepole pine terminal weevil . . . 10

PATHOLOGY

Dwarf mistletoe . . . 11
Root rots . . . 11
Air pollution . . . 11
Land use studies . . . 11

MAP

Distribution of major forest insects . . . Appendix

RESUMÉ OF CONDITIONS

ENTOMOLOGY

The once vast mountain pine beetle infestations, which affected much of the lodgepole pine, *Pinus contorta latifolia* Engelm., type of the Intermountain Region, have virtually subsided. This Regionwide decline, although not uniform, should continue during 1973. Two exceptions to the Regional decreasing trend were in the Warm River area on the Targhee National Forest, southeastern Idaho, and in the corridor between Grand Teton and Yellowstone National Parks, western Wyoming, where tree mortality increased. Of greatest concern today is the future management of these depleted stands. Studies to identify and measure mountain pine beetle-caused impact and to develop management alternatives have been initiated and will continue through 1973.

The mountain pine beetle continued to kill stagnated second-growth and mature ponderosa pine, *P. ponderosa* Laws., in and near Flaming Gorge National Recreation Area, Utah, and in areas southeast of Cascade, Idaho. The once active infestations in ponderosa pine in Bryce Canyon National Park and on the adjacent Dixie National Forest, Utah, continued to decline.

Mountain pine beetle-caused losses in whitebark pine, *P. albicaulis* Engelm. and limber pine, *P. flexilis* James, stands continued on the Teton and Bridger National Forests and Grand Teton National Park, Wyoming, and on the Targhee and Caribou National Forests, Idaho.

The most damaging Douglas-fir beetle infestation in Douglas-fir, *Pseudotsuga menziesii* Franco, stands occurred in the South Fork of the Boise River, Sawtooth National Forest, Idaho. An increasing infestation continued along the south side of the Continental Divide on the Targhee National Forest.

A damaging Engelmann spruce beetle outbreak in Engelmann spruce, *Picea engelmannii* Parry, continued in the upper drainages of Huntington Creek, Manti-LaSal National Forest, Utah. The infestation on Hilgard Mountain, Fishlake National Forest, Utah, decreased in extent and intensity during 1972.

Roundheaded pine beetle-caused losses of ponderosa pine were minimal in the Spring Mountains of southwestern Nevada.

Pine engraver beetles caused mortality of lodgepole pine on the Targhee National Forest, and in ponderosa pine on the Boise National Forest, Idaho.

Western spruce budworm defoliation increased in intensity and extent in two widely separated portions of the Region. The largest infestation was on the Payette National Forest, Idaho. A smaller infestation on three National Forests in Wyoming continued in 1972. In 1973, the Payette infestation is expected to remain at the 1972 level or increase slightly, but the Wyoming outbreak should decrease.

Visible defoliation of ponderosa pine caused by the pine butterfly was recorded for the first time during aerial detection flights in central Idaho. Populations of this insect have been increasing since 1968 and heavy defoliation was predicted for the Payette National Forest in 1973.

PATHOLOGY

Dwarf mistletoe remained the most serious forest disease problem in the Intermountain Region. Several direct control projects involving overstory removal and sanitation thinning were completed by Ranger District personnel during 1972.

Two new *Fomes annosus* root rot infection centers were located during 1972, bringing the Regional total to 37 centers. Regionwide losses were not a serious problem although limited tree mortality occurred.

Near the proposed site for a power-generating station at Page, Arizona, a sensitive test to measure sulfur in the air was conducted by personnel from the University of Utah. The normal background level of sulfur was established at 0.002 ppm. A series of closeup photographs of native plants were taken to provide additional base information for later comparison.

ENTOMOLOGY

Bark Beetles

Mountain pine beetle, *Dendroctonus ponderosae* Hopkins

Lodgepole pine

The almost continuous expanse of sorrel-topped

trees that dominated the lodgepole pine type for more than a decade, has practically disappeared. The hue of some of these vast areas, such as those along the North Slope of the Uinta Range, in the Teton wilderness, and in parts of the Targhee National Forest, has gradually transformed from red to green, tinged with varying shades of grey. In some areas, tree mortality was exceptionally heavy and poses many serious problems to the forest manager. In other areas, particularly at the higher elevations, mortality was considerably less severe with little or no effects on the existing stand structure.

The Regionwide decline was not uniform and some areas continued to support heavy beetle populations, which will cause increased tree killing for years to come. Two of the largest areas where increases have occurred are on the Targhee National Forest, southeastern Idaho, and in the corridor between Grand Teton and Yellowstone National Parks, western Wyoming.

The infestation on the Targhee National Forest is centered in the northeast portion of the Forest adjacent to Yellowstone National Park. Heavy tree killing is now underway in the Warm River area where suppression was terminated in 1970. Once this artifical restraint was curbed, local beetle populations resurged and caused sizeable increases in tree killing and losses of merchantable volumes. The infestation continued its northeasterly march through the interior of Yellowstone National Park and into the high-elevation stands of the Moose Creek Plateau, creating a serious threat to an existing sale of more than 250 MM board feet of uncut timber. Ground and aerial photographic surveys made within the Moose Creek sale boundaries in 1972 showed that the infestation had increased to an overall average attack level of 2.5 trees per acre. Even though much of the area contains many large diameter trees, overall mortality probably will not be as severe as elsewhere because of the relatively high elevations (7000-8000 feet). For example, losses should not be as extreme as in one stand just a few miles to the southeast in Yellowstone National Park (6400 feet), where approximately 26 percent of the trees 5.0 inches dbh and larger were killed during a seven-year period.[1] In the Moose Creek area control is not recommended; instead, efforts will be directed to maintaining an aggressive and orderly harvest of the ultimately threatened stands that lie in the path of the advancing infestation.

The outbreak to the east in Yellowstone National Park and in the Grand Teton-Yellowstone corridor (Grand Teton National Park and Teton National Forest) continued unabated. The outbreak in Grand Teton National Park resulted from a resurgence of beetle populations that were temporarily held in check by past suppression work. In both Grand Teton National Park and Teton National Forest, peak tree killing probably has occurred and should begin to decline. Elsewhere in both the Park and Forest, widely scattered tree killing continued, but at a very low level.

The long standing infestation on the Bridger National Forest, Wyoming, has run its course. On the Bridger Division, tree killing followed the Regionwide pattern of starting in the lower elevation stands, intensifying in place, and moving slowly but steadily uphill into stands at higher elevations. The infestation has already reached the upper elevational limits of lodgepole pine, declined in place, and in some areas, moved into nearby whitebark and limber pine stands. Scattered tree killing continued in portions of the Wyoming Division with the most active infestations persisting in the upper reaches of the Greys River. It appears that the southerly movement of this infestation has been curtailed by elevation and possibly by a lack of suitable host type. Tree killing continued in portions of the Little Greys River but at a reduced rate.

The mountain pine beetle continued to deplete lodgepole and mixed lodgepole and ponderosa pine stands in and near Flaming Gorge National Recreation Area, Ashley National Forest, Utah. Heaviest tree mortality occurred in low-volume, slow-growing lodgepole stands near Ute Lookout, and in the mixed stands surrounding Greendale Junction. The nearness of this infestation to highly developed recreation areas is of great concern. Many infested trees in the Greendale area will be removed during spring in an over-the-snow logging operation

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[1] Parker, Douglas L. 1972. Trends of a mountain pine beetle outbreak in Yellowstone National Park, 1966 to 1972. U.S. Dept. Agr., Forest Service, Division of Timber Management, Ogden, Utah. 5 pp., illus.

to minimize skidding damage as much as possible.

Widely scattered tree killing continued throughout portions of the Caribou National Forest in Idaho and the Cache National Forest[1] in Idaho and Utah. Although epidemics of the mountain pine beetle in lodgepole pine stands normally last from six to eight years, overall tree killing on these Forests will last considerably longer because of the widely separated nature of the stands, as well as differences in geography, elevation, stand structure and age. These extremely variable conditions make direct control impractical, other than by indirect methods such as salvage and high-risk logging. Many of these stands, unfortunately, are inoperable.

The long standing infestation in the upper reaches of the Bear River on the Wasatch National Forest, Utah, continued unchecked. Tree killing increased with new infestation centers appearing in the upper reaches of the Stillwater Fork. Widely separated, but less intense, outbreaks persist in the West Fork of the Duchesne River, in Pass Creek, and the upper Provo River, Uinta National Forest, Utah.

Variable conditions existed in portions of the Sawtooth National Forest, Idaho. Heavy tree killing continued in portions of the Twin Falls Ranger District and in Warm Springs Creek and Big Wood River on the Ketchum Ranger District. However, the persistent outbreak in the South Fork of the Boise River appeared to decrease. On the Challis National Forest, most current mountain pine beetle activity was in the Idaho Primitive Area and in the other back country regions. One localized control effort using the fall, pile, and burn technique was apparently successful in reducing tree losses in an improved campground in the Lost River Ranger District.

The Impact of The Mountain Pine Beetle on Lodgepole Pine

Of utmost concern today, as well as far into the future, is the status of the extensive forest areas seriously depleted by the mountain pine beetle. The land manager, who has inherited large acreages of these depleted stands, is now faced with the formidable task of redefining objectives and identifying various management alternatives. Before he can do this, he must have some ideas as to the net effect of these depleted areas on resource uses and values, i.e., impact. Studies to identify and measure these problem areas and to recommend alternative courses of action have been initiated and will continue through 1973. Hopefully, some of these studies will be completed and reported on by 1974.

Ponderosa pine

The mountain pine beetle continued to kill stagnated second-growth and mature ponderosa pine in several areas in Utah and Idaho. Of great concern was the infestation in the slow-growing, mixed ponderosa-lodgepole pine stands in and near Flaming Gorge National Recreation Area. All sizes and ages of trees were killed, ranging from a few isolated large trees to groups of stagnated second-growth. Increment cores taken from several trees in one group showed that, on the average, the trees required 44 years to produce the last inch of radial increment. Stands in this condition will remain highly vulnerable to mountain pine beetle attacks. Tree killing will increase in 1973 and should maintain a high level for the next two years, then begin to subside. Attempts to minimize future tree losses are discussed in the preceding section.

The once active infestation in Bryce Canyon National Park and on the adjacent Dixie National Forest continued to decline. However, scattered tree killing was detected throughout the ponderosa pine type in the Park and in the East Fork of the Sevier River on the Forest. Some concentrations of fading trees were still visible from vantage points along the Park highway. Both group and single tree attacks persisted in the southern half of the Escalante Ranger District on the Forest. In some cases, particularly in larger trees, mountain pine beetle broods are interspersed with those of the western pine beetle, *Dendroctonus brevicomis* LeConte.

The persistent infestation in stagnated second-growth ponderosa pine stands southeast of Cascade, Idaho, continued for the ninth consecutive year. In some areas more than 60 percent of the

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[1] The Cache National Forest has been dissolved. The northern half was added to the Caribou National Forest and the southern half to the Wasatch National Forest.

stand (5.0 inches dbh and larger) has been killed, with losses most severe in the smaller diameter trees. This infestation will decline because of lack of host material.

Whitebark and limber pine

Mountain pine beetle-caused losses in whitebark and limber pine stands continued on the Teton and Bridger National Forests and in Grand Teton National Park in Wyoming and on the Targhee and Caribou National Forests in Idaho. Annual aerial survey data show that mortality in these soft pines was preceded by massive outbreaks in lodgepole pine stands at lower elevations. It is assumed that the beetle populations, which developed for several generations in lodgepole pine stands, infested the other host species, even though existing evidence is only circumstantial. Nevertheless, both hosts obviously were susceptible at the same period of time and could have been killed by the same beetle population.

Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins

The Douglas-fir beetle continued to kill large numbers of Douglas-fir trees on the Sawtooth, Boise, Payette, and Challis National Forests, Idaho, in 1972. The most damaging infestation was on the Fairfield Ranger District, Sawtooth National Forest, and was centered in the South Fork of the Boise River, Smoky Creek, and Lime Creek. Elsewhere on the Forest, scattered mortality occurred in Willow Creek, Fairfield Ranger District; Deer and Warm Springs Creeks, Ketchum Ranger District; and along the north facing slope of the Salmon River from Four Acres Creek to Slate Creek, Sawtooth National Recreation Area. On the Payette National Forest, tree killing decreased, but some localized tree mortality occurred on the Weiser, Council, and McCall Ranger Districts. Tree killing on the Challis National Forest also decreased in 1972. Scattered mortality was detected on the Yankee Fork Ranger District.

On the Targhee National Forest, beetle populations have been on the rise since 1969, a direct result of large accumulations of storm-damaged Douglas-fir. Salvage logging was initiated to reduce the potential insect hazard and at the same time to utilize the damaged material. Unfortunately, because of the magnitude and extent of damage, attempts at suppression through salvage logging were only locally successful; and beetle populations moved into standing trees. Heaviest mortality occurred along Big Bend Ridge on the Ashton and Island Park Ranger Districts and in stands along the southwestern side of the Continental Divide, Island Park Ranger District. Losses probably will be heavier in 1973.

Salvage logging and adequate slash disposal was recommended for accessible areas. Although these measures may be somewhat effective in localized areas, the overall trend will not be affected. Douglas-fir beetle outbreaks in standing trees should not continue indefinitely but subside naturally. However, serious losses will occur before the outbreaks decline.

Anti-attractant test

In 1972, a cooperative effort to test a synthesized anti-aggregating pheromone, methylcyclohexenone was undertaken by entomologists from the Intermountain Forest and Range Experiment Station; the States of Idaho and Oregon; and the Intermountain Region. The purpose of the test was to determine the effectiveness of the material in preventing attacks of the Douglas-fir beetle in freshly cut Douglas-fir logs. Methods involved two means of application and three concentrations. The Region 4 test was conducted on the Lowman Ranger District of the Boise National Forest. Results of these tests will be reported at a later date.

Engelmann spruce beetle, *Dendroctonus rufipennis* (Kirby)

Three Engelmann spruce beetle outbreaks continued in Engelmann spruce stands on two National Forests in Central Utah in 1972. The most damaging infestation was centered in the upper drainages of Huntington Creek on the Manti-LaSal National Forest. Scattered patches of windthrown spruce evidently contributed to the buildup (Fig. 1). The infestation was detected in 1970 during the aerial survey, and increasing trends in tree mortality were recorded in 1971 and 1972. Heavy losses have

Figure 1. Aerial photography of Engelmann spruce mortality caused by the Engelmann spruce beetle, *Dendroctonus rufipennis* (Kirby), near Huntington Reservoir on the Manti-LaSal National Forest, Utah. Patches of windthrown spruce (center of photo) contributed to the beetle buildup.

occurred and will continue during 1973. Due to the extent of the outbreak, the innate potential for population increases, the resultant losses, the relatively poor access, and the high cost of individual tree treatment with chemicals, overall suppression of the outbreak was determined to be impractical. Salvage logging was recommended. On the Fishlake National Forest, beetle-caused spruce losses continued on the Beaver Ranger District. Again, salvage logging was recommended. Another outbreak on Hilgard Mountain, Loa Ranger District, decreased in extent and intensity in 1972.

Elsewhere in the Region, widely scattered mortality was detected on the Dixie National Forest in southern Utah and the Bridger and Teton National Forests in western Wyoming.

Roundheaded pine beetle, *Dendroctonus adjunctus* Blandford

Killing of ponderosa pine by both this beetle and the western pine beetle continued in the Spring Mountains, Toiyabe National Forest west of Las Vegas, Nevada. However, the infestation has been decreasing for several years and losses were minimal in 1972. The aggressive sale of infested trees in roaded areas possibly has helped to reduce losses of high-value trees near summer homes, campsites, etc. Elsewhere, the infestation decreased naturally.

Pine engraver beetles, *Ips* spp.

Lodgepole

Significant killing of small diameter lodgepole pine trees by pine engraver beetles, as well as other secondary bark beetles, was detected on the Targhee National Forest. These losses occurred as an aftermath of the recent mountain pine beetle outbreak, i.e., populations built up in trees killed by the mountain pine beetle. Also, storm-damaged trees on the Forest provided additional habitat which contributed to population increases and susequent tree mortality. Continued losses are expected in many areas in 1973.

Ponderosa pine

Tree killing of second-growth ponderosa pine caused by the pine engraver beetle, *Ips pini* (Say), has been a continuing problem in and adjacent to active logging areas in southwestern Idaho. On the Boise National Forest, tree losses increased from 1971 to 1972. Scattered winter storm damage to stands apparently contributed to the increased losses. The insect will not sustain itself indefinitely in standing trees, and in the absence of new slash, thinning debris, or storm-damaged material, populations will subside. Proper disposal of slash was recommended to help prevent possible buildups.

Defoliators

Western spruce budworm, *Choristoneura occidentalis* Freeman

Douglas-fir and true fir Forests of the Intermountain Region have a long history of western spruce budworm activity with the present string of outbreaks reaching back to the early nineteen fifties. In ensuing years, control was undertaken periodically, but overall defoliation increased. The peak level of budworm activity occurred in 1964, the same year that a 525,000-acre aerial spray project was conducted on the Salmon National Forest. Since then, budworm defoliation decreased to a low level of slightly more than 200,000 acres in 1967, increased to more than a half million acres in 1968, and has fluctuated in this range to the present time (Table 1). Current centers of defoliation are in southern Idaho and western Wyoming.

The anticipated increase in both intensity and extent of western spruce budworm defoliation materialized during 1972, but not to the extent that really serious damage occurred (Table 2). The largest single increase in area and intensity of defoliation was on the Payette National Forest with lesser increases recorded in many of the smaller and widely separated areas throughout portions of the

Table 1. Areas of western spruce budworm defoliation during the past ten years in the Intermountain Region, as determined by aerial reconnaissance.

Year	Light (acres)	Moderate (acres)	Heavy (acres)	Total (acres)
1963	357,800	276,600	988,800	1,623,200
1964	266,000	658,000	1,352,000	2,276,000
1965	465,600	254,500	795,200	1,515,300
1966	923,900	52,200	16,100	992,200
1967	162,200	54,900	1,600	218,700
1968	333,500	150,200	21,800	505,500
1969	388,800	125,400	30,200	544,400
1970	223,200	79,300	5,200	307,700
1971	229,300	110,300	34,300	373,900
1972	395,300	100,700	9,500	505,500

Table 2. Areas of western spruce budworm defoliation on National Forests in the Intermountain Region, as determined by aerial reconnaissance in 1972.

Forest	Light (acres)	Medium (acres)	Heavy (acres)	Total (acres)
Boise	1,600	2,600		4,200
Bridger	29,000	26,000	1,800	56,800
Caribou	1,000			1,000
Challis	28,900	4,800		33,700
Payette	328,400	64,200	7,500	400,100
Salmon	900			900
Targhee	2,500	1,100		3,600
Teton	3,000	2,000	200	5,200
Total	395,300	100,700	9,500	505,500

Boise, Challis[1], and Salmon National Forests. Many of these areas are in the remote Idaho Primitive Area which includes portions of the four Forests.

The infestation in western Wyoming has been in progress since 1965, and covers portions of the Bridger, Teton, Targhee National Forests, Wyoming, and Caribou National Forests, Idaho. More than 85 percent of the infestation was on the Bridger National Forest. Heavy defoliation was visible for the third consecutive year in the Grand Canyon of the Snake River, which contains a main route to Grand Teton and Yellowstone National Parks.

No noticeable or widespread mortality of mature and overmature trees occurred during recent years. In areas sustaining repeated defoliation such as Fall Creek on the Payette National Forest, and Roos, Pine, and Squaw Creeks on the Bridger National Forest, some top kill and mortality of the suppressed understory occurred. However, the most extensive and probably the most significant effect was reduced radial increment. It is now known that in the older outbreak areas where budworm populations declined, such as those on the Salmon National Forest, there has been a general and significant resurgence in tree growth. The net effects of this loss and eventual recovery are not known, however.

The outlook for 1973 is generally encouraging. An analysis of egg mass evaluation data indicates a general decrease in budworm numbers and subsequent defoliation in the Bridger infestation, and static to slightly increasing activity on the Payette National Forest. In some areas heavy defoliation will occur, particularly north and west of the town of McCall, Idaho.

Control was not recommended.

A pheromone test

In a cooperative program with the Pacific Northwest Forest and Range Experiment Station, the pheromone, Soolure, was field tested against moth

[1] That portion of the Challis National Forest was formerly part of the Boise National Forest (see map, appendix).

populations in ten widely spaced areas on the Payette National Forest. Sticky traps baited with Soolure were placed at the lowest crown position on some trees and at three crown levels on others to test their effectiveness at attracting and trapping flying male moths. Collections were made on an every-other-day schedule when possible, and traps and bait were changed when required. Data comparing trap counts with egg mass counts, are now being analyzed. One interesting finding was that traps placed at mid- and upper-crown levels trapped more than four and five times (respectively) as many adults than those at the skirt of the trees. This is important to know in the detection of very low budworm populations.

Western spruce budworm impact

Recognizing the need for accurate western spruce budworm impact data on Douglas-fir stands in Region 4, efforts were initiated in 1971 to record tree mortality, increment growth, and collect stand structure data. In addition to gathering impact information, a secondary goal was achieved by improving sampling techniques. Even though analyses of data and ring measurements have not been completed, a preliminary examination of these data indicate the following:

1. Douglas-fir mortality ranged from 11.2 percent of the number of trees per acre in sample areas where the infestation had subsided to less than one percent in areas with current infestations. Most of the mortality occurred in the suppressed trees in the understory.

2. Top kill averaged 1.8 percent of the trees per acre in areas with current infestations.

3. Most trees sampled showed reduced radial growth during periods of budworm defoliation. However, since records of defoliation of past budworm outbreaks are fragmentary, a correlation between degree of defoliation and reduced radial increment was not possible.

4. Similar radial growth trends were recorded from disc samples cut at intervals along the bole, indicating that growth measurements taken at d b h may adequately represent growth trend (Fig. 2).

5. Following a decline in budworm activity on the Salmon National Forest, Idaho, radial growth increased at a steady rate .

6. Terminal growth followed the same trend as radial growth, i.e., several years of reduced terminal growth was followed by a rapid recovery after the outbreak subsided.

Douglas-fir tussock moth, *Hemerocampa pseudotsugata* (McDunnough)

This insect reached outbreak proportions in two isolated areas in southern Nevada. Heavy defoliation of white fir, *Abies concolor* (Gord. & Glend.) stands occurred near a Boy Scout Camp in the Spring Mountains. Both mature trees and reproduction were affected. The second outbreak, 60 acres in size, was in the Virgin Mountains. In this infestation both white fir and Douglas-fir trees were heavily defoliated, but white fir sustained the heaviest damage. Both of these infestations are expected to continue.

Douglas-fir stands around South Mountain on State and private lands in Owyhee County, Idaho, were moderately defoliated by the Douglas-fir tussock moth. A polyhedrosis virus reduced the population in 1971, but the outbreak continued. A biological evaluation was not conducted in 1972 and the trend of the infestation is unknown.

A sawfly, *Neodiprion fulviceps* (Cresson)

Larvae of this sawfly have been active in a small patch of mature ponderosa pine in Clear Creek Fishlake National Forest, Utah, since 1970. Some trees have incurred heavy to severe defoliation for three consecutive years. All of these trees were alive after two years of almost total defoliation, but it is possible that they may not survive a third year of damage. Larval populations will be low in 1973, simply because of a lack of foliage and suitable oviposition sites. Many of the weakened trees will be highly vulnerable to attacks by secondary insects, i.e., *Ips* spp. Control was needed but not undertaken because there is no registered insecticide for this destructive pest.

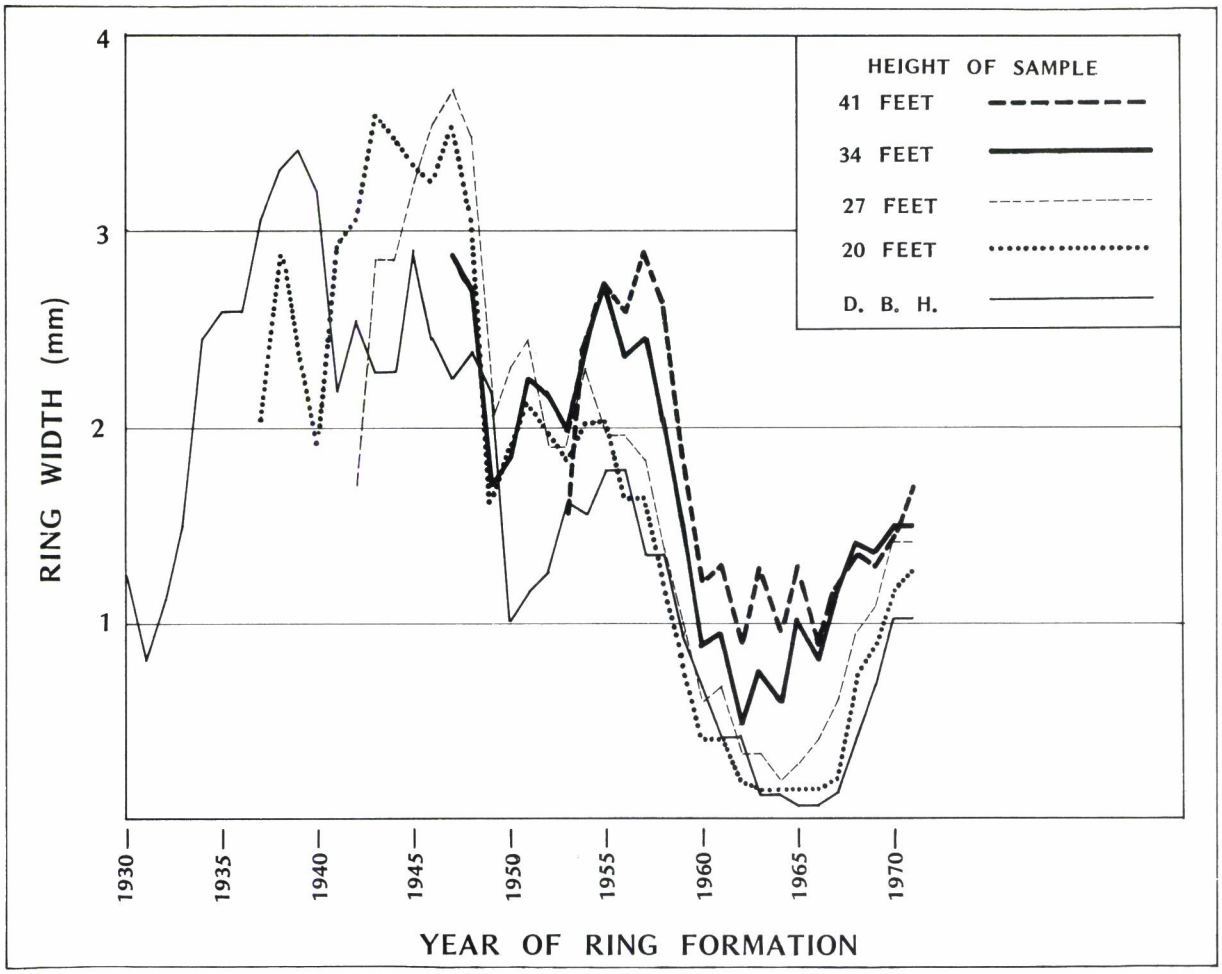

Figure 2. Vertical growth sequence of a 6.8-inch dbh Douglas-fir tree from 4th of July Creek, Salmon National Forest, Idaho, showing the similarity of growth trends.

Spruce needle miner, *Taniva albolineana* (Kearfott)

An outbreak of the spruce needle miner and another needle miner, *Coleotechnites* sp., was reported on ornamental blue spruce at a homesite in Emigration Canyon near Salt Lake City, Utah. The infestation was light and the trees were not greatly affected. This may be the first record of these insects in Utah.

A leafroller, *Archips negundanus* (Dyar)

An outbreak of this leafroller on boxelder, *Acer negundo* L., was detected in northern Utah in 1968. The infestation increased in extent in subsequent years and by 1972, defoliated trees were observed from the northern Utah border south along the Wasatch Mountain Range. Due to a lack of information on the biology and habits of this insect, biological data were collected during the course of evaluations and the results published.[1]

Extensive defoliation of trees along streets, near homes, and in parks in Salt Lake City, Utah, occurred in 1972; and the Parks Department of the City conducted a control program using Diazion and Sevin. The results of the control program were not reported.

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[1] Parker, Douglas L. and Maxine W. Moyer. 1972. Biology of a leafroller, *Archips negundanus*, in Utah (Lepidoptera: Tortricidae). Ann. Entomol. Soc. Amer. 65(6): 1415-1418.

Pine butterfly, *Neophasia menapia* (Felder & Felder)

Pine butterfly populations have been increasing in central Idaho since 1968, but visible defoliation of ponderosa pine stands did not occur until 1972 (Fig. 3). During aerial detection flights in 1972, 4,400 acres of heavy defoliation and 2,400 acres of moderate defoliation were recorded on the Payette National Forest, McCall Ranger District. On the Boise National Forest, very light defoliation was detected during on-the-ground surveys, but the defoliation was too light to be seen during aerial survey flights. More extensive and heavier defoliation was predicted for 1973 in portions of both the Payette and Boise National Forests.

Figure 3. Eggs of the pine butterfly, *Neophasia menapia* (Felder & Felder). Larvae have emerged from the light colored eggs.

Western tussock moth, *Orygia vetusta gulosa* (Hy. Edwards)

Moderate to heavy defoliation of a Ceanothus sp. by this insect was observed in 34 widely separated areas on the southern portion of the Boise National Forest and adjacent Bureau of Land Management lands. Acreage and intensity of defoliation were less than in 1971. Stands of newly planted ponderosa pine were not attacked.

California tortoise-shell butterfly, *Nymphalis californica* (Boisduval)

This insect caused defoliation of a *Ceanothus* sp. and a *Salix* sp. on the Payette, Boise and Sawtooth National Forests. The *Ceanothus* sp. was more heavily defoliated. Trees adjacent to infested areas were not attacked. The outbreak is expected to continue in 1973.

OTHER FOREST INSECTS

Lodgepole pine terminal weevil, *Pissodes terminalis* Hopping

Damage by this weevil can be found in most lodgepole pine reproduction areas in the Intermountain Region. The insect kills the terminal leaders of sapling-size trees and appears to cause the heaviest damage in relatively open-grown stands (Fig. 4). In most infestation areas, individual trees have sustained repeated attacks. Due to efforts to increase the harvest of mountain pine beetle threatened lodgepole pine and thereby create more reproduction sites, this insect may become a serious problem. Studies are now in progress to determine the long term effect of the weevil on growth and form of affected trees.

Figure 4. Larva of the lodgepole pine terminal weevil, *Pissodes terminalis* Hopping.

PATHOLOGY

Dwarf mistletoe, *Arceuthobium* spp.

Dwarf mistletoe is the most serious forest disease problem in the Intermountain Region. Yearly losses are conservatively estimated at 135 MM board feet.

Due to the extent and severity of this problem, direct control projects have been conducted by Ranger District personnel. Areas where the timber has been high-graded in the past, leaving an infected overstory to reinfect the regeneration, are good prospects for insect and disease control funded control projects. The timber on many such areas sold for minimum stumpage and little or no K-V funds were collected. Dwarf mistletoe control funds can be used to reduce the levels of infection on such areas. Selection of areas for control projects are based on certain criteria: abundant advance regeneration; good site; and noncommercial overstory. Insect and disease control funds can be used to kill the overstory and to do a sanitation-thinning operation in the understory. Only dwarf mistletoe infected trees can be cut with disease control funds. The balance of the cost of the sanitation thinning must be paid with other funds.

Eleven dwarf mistletoe control projects were planned in C.Y. 1972 for a total of 569 acres. The removal of approximately 2,600 old-growth dwarf mistletoe infected overstory ponderosa pine on 1,000 acres of a replanted burn was also planned. In September, the unobligated portion of the dwarf mistletoe control funds was withdrawn for other higher priority use. A total of 396 acres were treated before the withdrawal. Five of the projects were overstory removal and sanitation thinning in lodgepole pine stands infected by lodgepole pine dwarf mistletoe, *Arceuthobium americanum.* Four other projects involved removal of Douglas-fir infected overstory infected by Douglas-fir dwarf mistletoe, *A. douglasii.*

Root rot, *Fomes annosus* (FR.) Cke.

To date, 37 *Fomes annosus* root rot infection centers have been discovered in the Intermountain Region. Regionwide, losses to this parasite are not serious, even though occasional localized infection centers or groups of centers may cause significant tree mortality. This fungus is most commonly found in subalpine fir, *Abies lasiocarpa* (Hook.) Nutt. Ponderosa pine seems to be the next most susceptible species.

In 1972, two *Fomes annosus* root rot infection centers were located. One infection center was in white fir in Incline Village at the north end of Lake Tahoe. Logging or clearing for homesites appeared to be the activity that created the infection court. Host species was white fir. Another infection center was found at Ditch Creek on the North Fork Ranger District of the Salmon National Forest. The infection court was created by logging; ponderosa pine reproduction was being killed.

Air pollution

The construction of a power-generating station on the south shore of Lake Powell near Page, Arizona stimulated interest in the effects of SO_2, NO_x, and fly ash emissions upon the lake and the vegetation on surrounding lands. A sulfation plate network, operated for 1 year, revealed no sulfur in the air. Another, more sensitive test, conducted by personnel from the University of Utah, revealed 0.002 ppm levels of sulfur, which is generally considered natural background.

In order to have a "base line" against which to compare possible air pollution effects on vegetation, a study was initiated to obtain a series of closeup photographs of representative plants. The study will continue after the generating station begins operation in the spring of 1974.

Land use studies

At the request of the Salmon River Wild and Scenic Rivers Study Coordinator, seven days were spent on the Salmon River between North Fork and its confluence with the Snake River. The purpose of the study was to assess the forest disease situation in river corridor. Both Douglas-fir and ponderosa pine dwarf mistletoe were found to be present, but impact was minor. Heart rots of ponderosa pine were strongly correlated with fire scars, but it was not possible to predict the impact in terms of total tree volumes. There were no consistent external indicators of heart rot in Douglas-fir, although an

occasional tree was heart rotted. Pine needle cast, *Elytroderma deformans* (Weir), was very common on ponderosa pine in the river bottom. A general assessment of the overall tree disease situation is that no serious problems exist in the river corridor.

DISTRIBUTION OF MAJOR FOREST INSECT INFESTATIONS IN REGION 4 *

1972

LEGEND

- Mountain Pine Beetle
- Douglas-fir Beetle
- Western Spruce Budworm
- Engelmann Spruce Beetle

Based on aerial and ground surveys

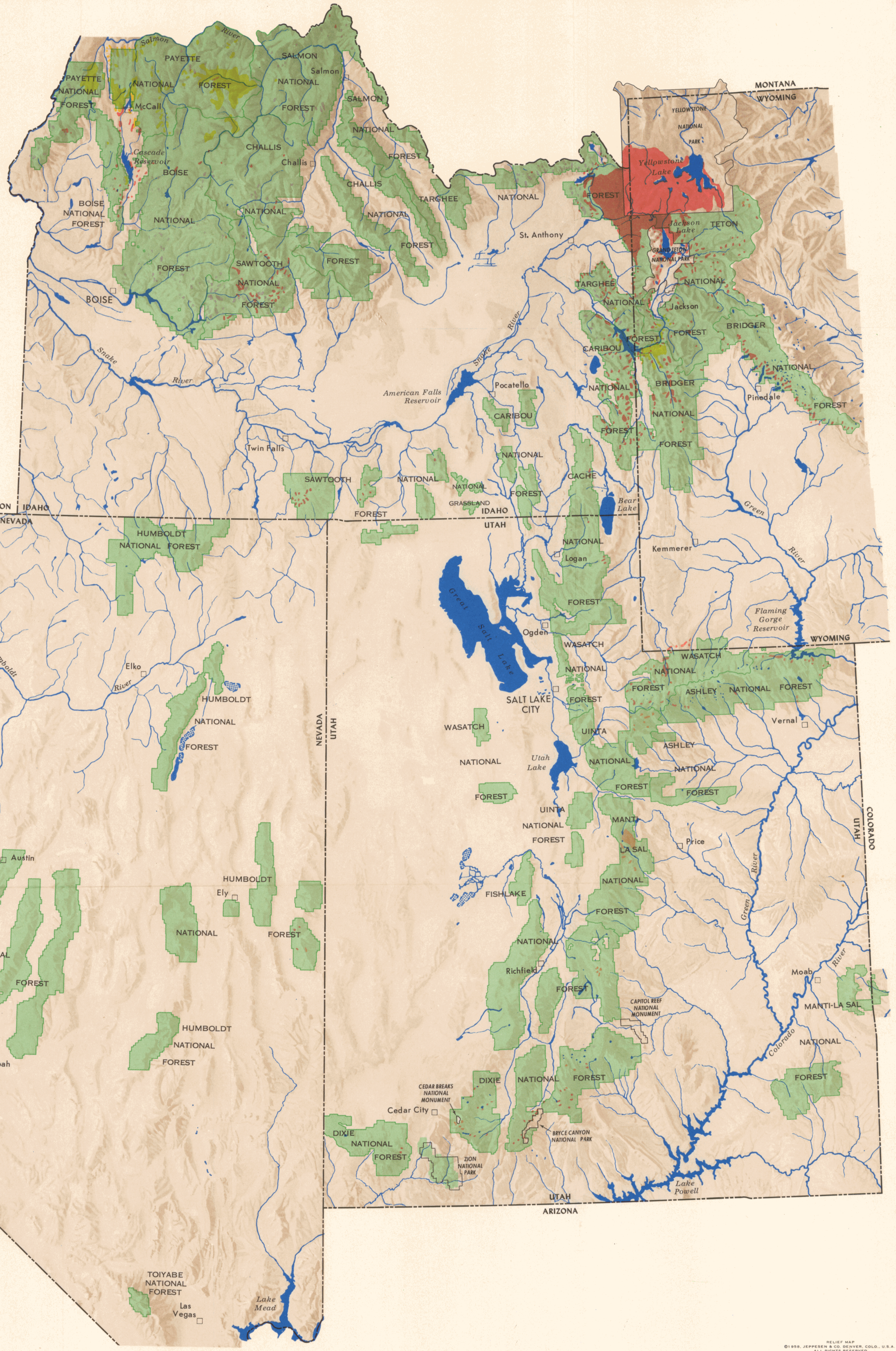
DIVISION OF TIMBER MANAGEMENT

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

SCALE *miles* 0 40

*Recent reorganization has resulted in numerous boundary changes which are not shown on this map.



RELIEF MAP
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